Course Specifications

Valid as from the academic year 2016-2017

Molecular Biological Analysis (O000020)

Course size *(nominal values; actual values may depend on programme)*

Credits 5.0	**Study time 150 h**	**Contact hrs**	60.0 h

Course offerings and teaching methods in academic year 2016-2017

A (semester 2)	lecture	30.0 h
	practicum	15.0 h
	excursion	2.5 h
	seminar: practical PC room classes	12.5 h

Lecturers in academic year 2016-2017

Radwanska, Magdalena	CA10	lecturer-in-charge
Magez, Stefan	CA10	co-lecturer

Offered in the following programmes in 2016-2017	crdts	offering
Bachelor of Science in Food Technology	5	A
Joint Section Bachelor of Science in Environmental Technology, Food Technology and Molecular Biotechnology	5	A
Bachelor of Science in Environmental Technology	5	A
Bachelor of Science in Molecular Biotechnology	5	A

Teaching languages

English

Keywords

DNA/ RNA Purification, Restriction Enzymes, Sanger Sequencing and Next Generation Sequencing, Hybridization, Micro-arrays, PCR, Quantitative PCR, Cloning in Prokaryotic Vectors, Expression Library Screening, Protein Expression and Analysis, Antibody Based Protein Analysis, Primer Design, Sequence Alignments, Database Searches, Gene Prediction and Annotation.

Position of the course

The Molecular and Biological Analysis explains and illustrates approaches, techniques, and tools used in modern molecular biology while dealing with nucleic acids and proteins. This course builds on the knowledge gained by the students in the Living World 1 and 2.

Contents

1. General Aims and Applications of Molecular Biological Analysis.
2. DNA/RNA Analytic Techniques and Applications (Disease Diagnostics, Personalised Medicine and Therapy, 'Omic' analysis, Forensic Analysis).
3. DNA/RNA Purification and Analysis (Restriction Enzyme Analysis, Variable Number Tandem Repeat Analysis, DNA Electophoresis, Hybridization, Sequencing, Single Nucleotide Polymorphism).
3. DNA Amplification (Polymerase Chain Reaction (PCR), Quantitative Real-Time PCR, LAMP amplification).
4. Prokaryotic Expression Vectors.
5. Screening of Expression Libraries.
6. Gene Silencing.
7. Protein Sequence Analysis and Applications.
8. Protein Production and Purification (Various Chromatographic Techniques: HPLC, FPLC, Affinity Chromatography and Others)
9. Protein Electrophoresis (PAGE, SDS-PAGE, IEF, 2D-elektrophoresis).

10. Immunological Analytic Techniques and Applications (Disease Diagnostics).
11. Enzyme Immunoassays, Immunoblotting, Fluorescence and Radioimmunoassay, Biosensor Assay to Measure Intermolecular Interactions.
12. Basic bio-informatics: Pairwise and Multiple Sequence Alignments, Homology, Database Similarity Searching, BLAST, FASTA, Motif Detection, Gene Prediction and Annotation. In silico Translation, Restriction, Mutation Detection, and Primer Design.

Initial competences

Knowledge and understanding of the structure and function of the genetic material and proteins is required as well as cellular and microbial function. Competences acquired in the Living World 1 and 2 are essential.

Final competences

Students have a basic understanding of the principles of molecular biological analysis and know when and how to apply a certain technique while dealing with nucleic acids and proteins. The course gives a comprehensive overview of applications in various fields of Biology, Medicine, and Applied Biotechnology.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Excursion, lecture, practicum, seminar: practical PC room classes

Learning materials and price

PowerPoint slides, movies, and handouts of practical exercises are available as learning materials.

References

From Genes to Genomes. Concepts and applications of DNA technology. Eds. Jeremy W. Dale, Malcolm von Schantz & Nick Plant, Wiley-Blackwell 2012, Gene Cloning and DNA Analysis. T.A. Brown, sixth edition, Wiley-Blackwell 2010.

Course content-related study coaching

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions

Examination methods in case of periodic evaluation during the second examination period

Examination methods in case of permanent evaluation

Skills test, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

Participation in the practical and laboratory exercises and excursions is mandatory in order to pass the course, as well as the submission of a practical course report.

Calculation of the examination mark

Written exam with open questions. 80%
Practical laboratory exercises. 10%
Report from the practical laboratory exercises. 10%